



National Aeronautics and Space Administration

NASA Ames Research Center NAMS Short Overview

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Associate Director, Technical
NASA Ames Research Center

2014

Updated 08/21/12

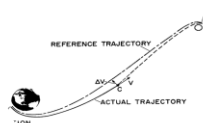
Seven Decades of Innovation



Tektites



Blunt Body Concept



Apollo Guidance System



X-36



Lunar Prospector



SOFIA

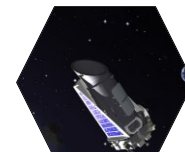
2013



Space Biology



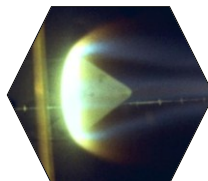
Lunar Science Institute



Kepler



Flight Simulator



Apollo Heat Shield Tests



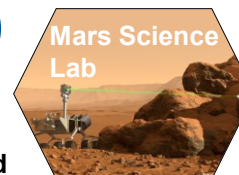
Pioneer 10/11



Galileo

1990

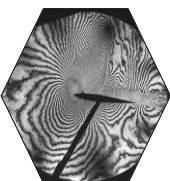
2000



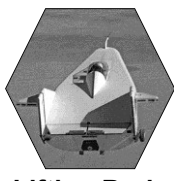
Mars Science Lab



Sustainability Base



Transonic Flow



Lifting Body



Life Sciences Research

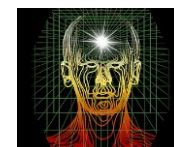


Pioneer Venus

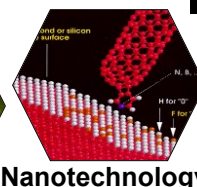


Viking

1980



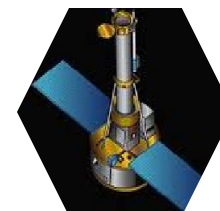
Human Centered Computing



Nanotechnology



NASA Research Park



IRIS



Aero Institute

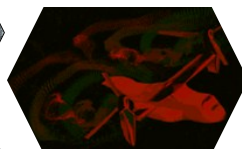


Swept-Back/Wing



Flight Research

1960



CFD



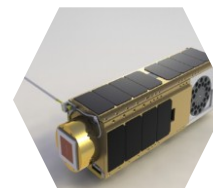
Tiltrotor



Kuiper Observatory



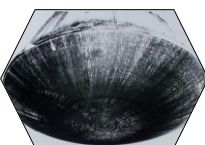
ER-2



O/OREOS



LCROSS

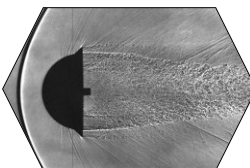


Apollo Re-Entry Shape

1950



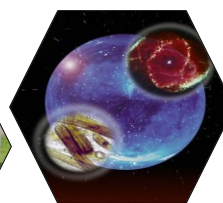
Arcjet Research



Hypervelocity Free Flight



80x120 Wind Tunnel



Astrobiology Institute



One of the World's Fastest Operational Supercomputers Pleiades



LADEE

1940



Conical Camber



National Aeronautics and
Space Administration



Ames Today



- **2480 employees***
- **\$900M + annual revenue**
(including reimbursable)
- *in addition, 900 students, summer 2013

- **Science**
 - Space, Earth, Biological Sciences
 - Astrobiology, Lunar Science
- **Exploration Systems**
 - Exploration Technology Development
 - Thermal Protection Systems
 - Supercomputing
- **Projects and Missions**
- **Aeronautics & Aviation**
 - NextGen Airspace Systems
 - Fundamental Aeronautics
 - Aviation Safety
 - Green Aviation
- **Affordable Small Satellites**
- **Innovation, Education, & Entrepreneurial Collaborations**
 - NASA Research Park



National Aeronautics and
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Science Missions

- History of Successful Mission Management
- 40 Years of Airborne Astronomy
- Stratospheric Observatory For Infrared Astronomy (SOFIA)
- Kepler Mission - Search for Habitable Planets
- Lunar Crater Observation and Sensing Satellite (LCROSS)
- Near Earth Objects





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Lunar Crater Observation and Sensing Satellite (LCROSS): Finding Water on Moon

**Lunar Kinetic Impactor Mission was employed
to look for water ice at the Moon's South Pole**

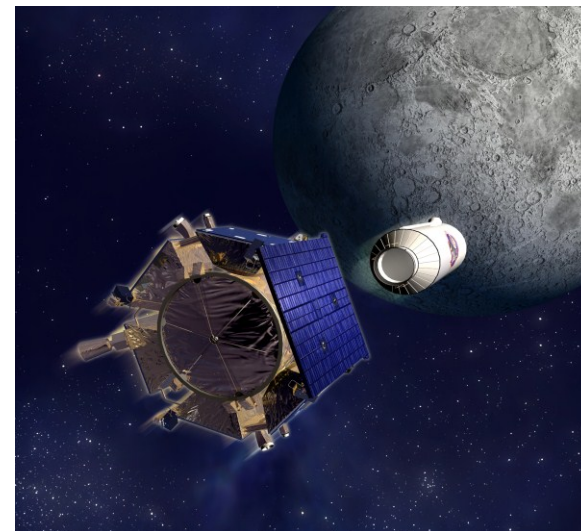
Launched: June 2009

Lunar Impact: October 2009

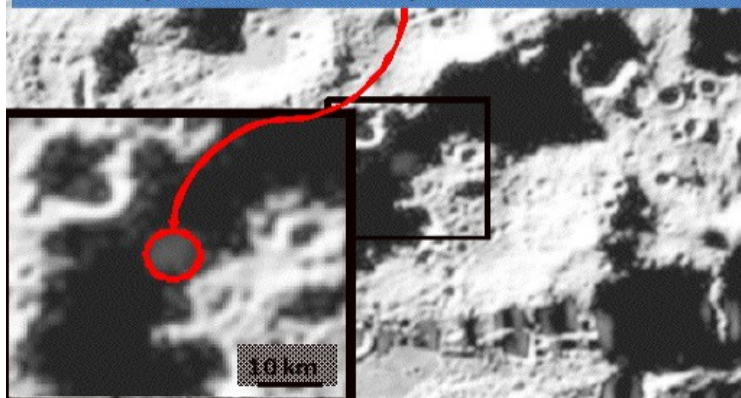
Impact believed to be within 100m of target

Collected 4 minutes of data

YES- THERE IS WATER ON THE MOON!!!



**Field of View of instruments making measurements
of the vapor and debris composition**



**LCROSS heading
to Moon**



**Centaur Impact:
T=0**



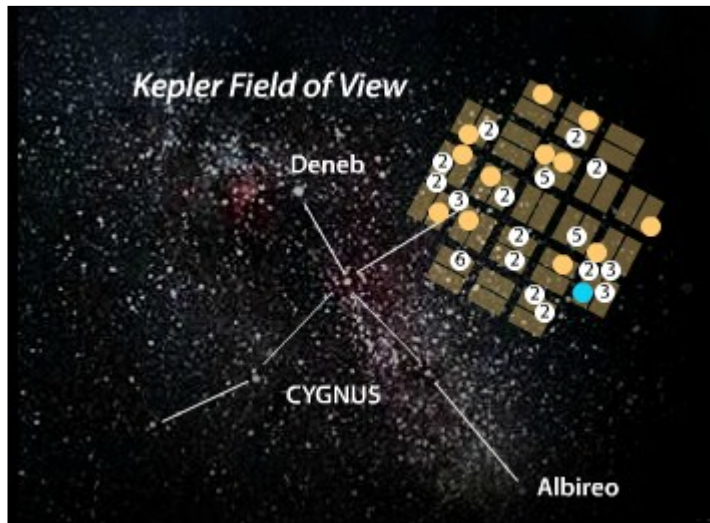
**Shepherding
Spacecraft Impact:
T + 4 mins**



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Kepler: The Search for Habitable Planets

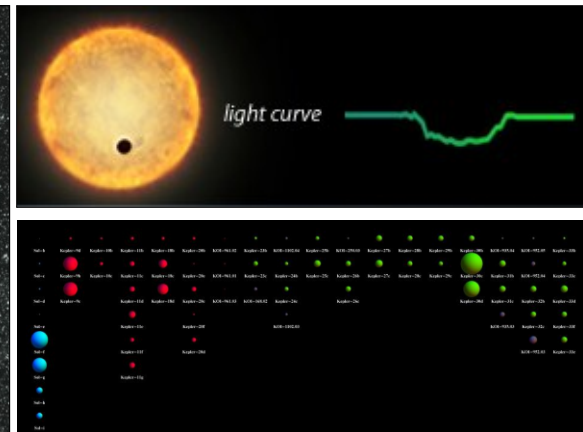
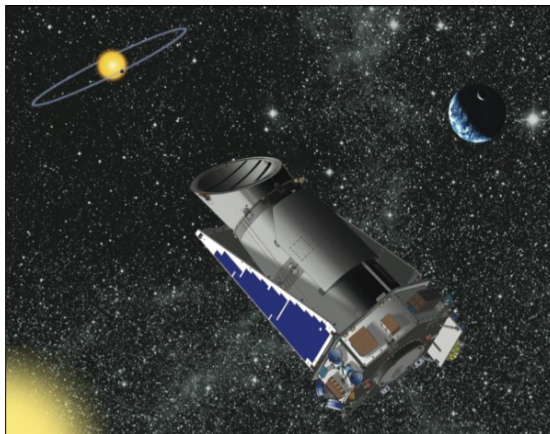
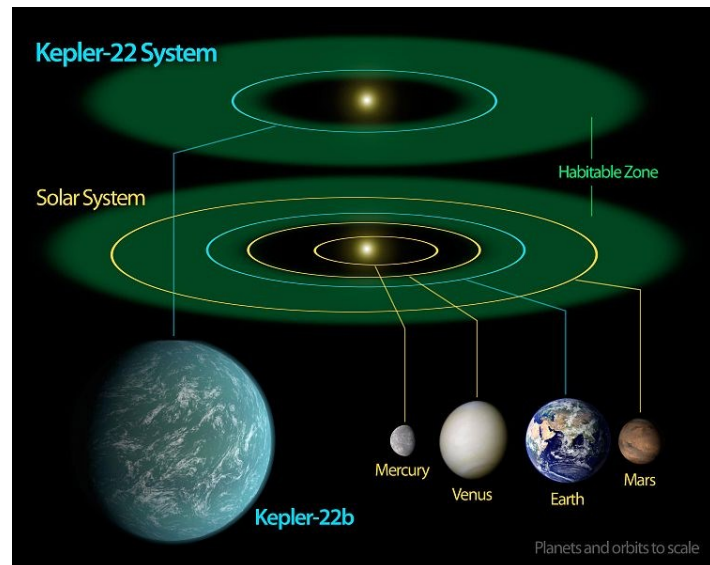


✧ **Mission:** survey part of the Milky Way galaxy to find Earth-size planets in or near the habitable zone and determine how many of the billions of stars in our galaxy have such planets.

✧ **Launch Date:** March 2009

✧ **Science Observations:** started May 2009

✧ **Discoveries:** 2,326 planet candidates as of December 5, 2011





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SOFIA- Stratospheric Observatory for Infrared Astronomy

Joint program by NASA AMES/Dryden
and German Aerospace Center (DLR).

Boeing 747SP aircraft equipped with a
2.8 m IR telescope.

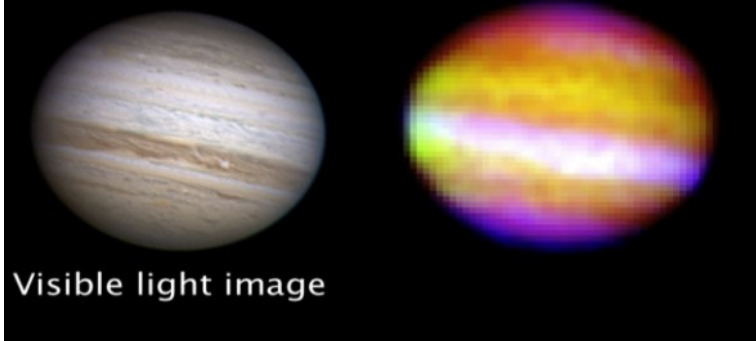
Largest airborne observatory in the
world.

Explores the infrared universe above the
interference from the Earth's water
vapor atmosphere.

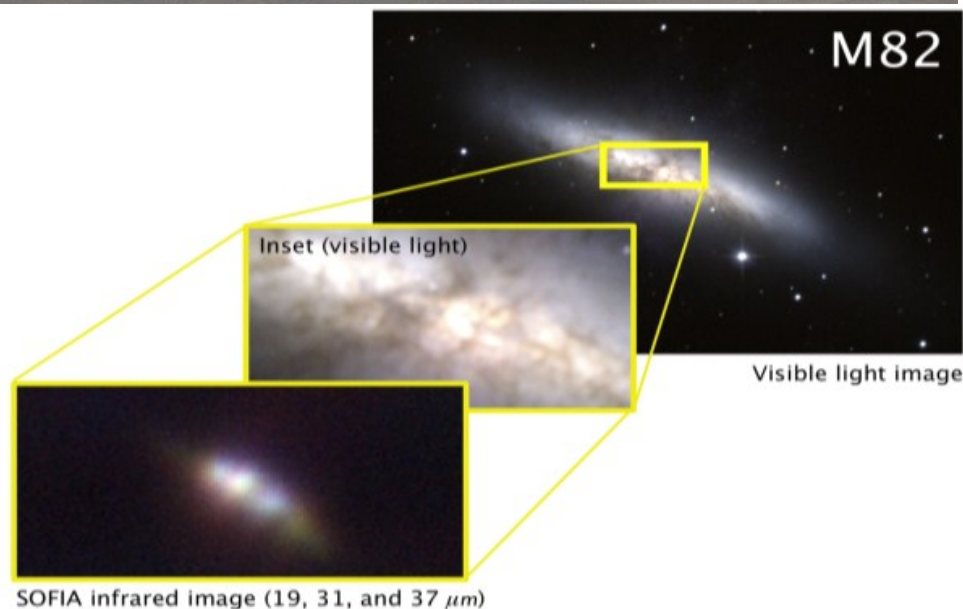
June 2010: First Light seen



SOFIA infrared image
(5.4, 24, and 37 μm)



Visible light image

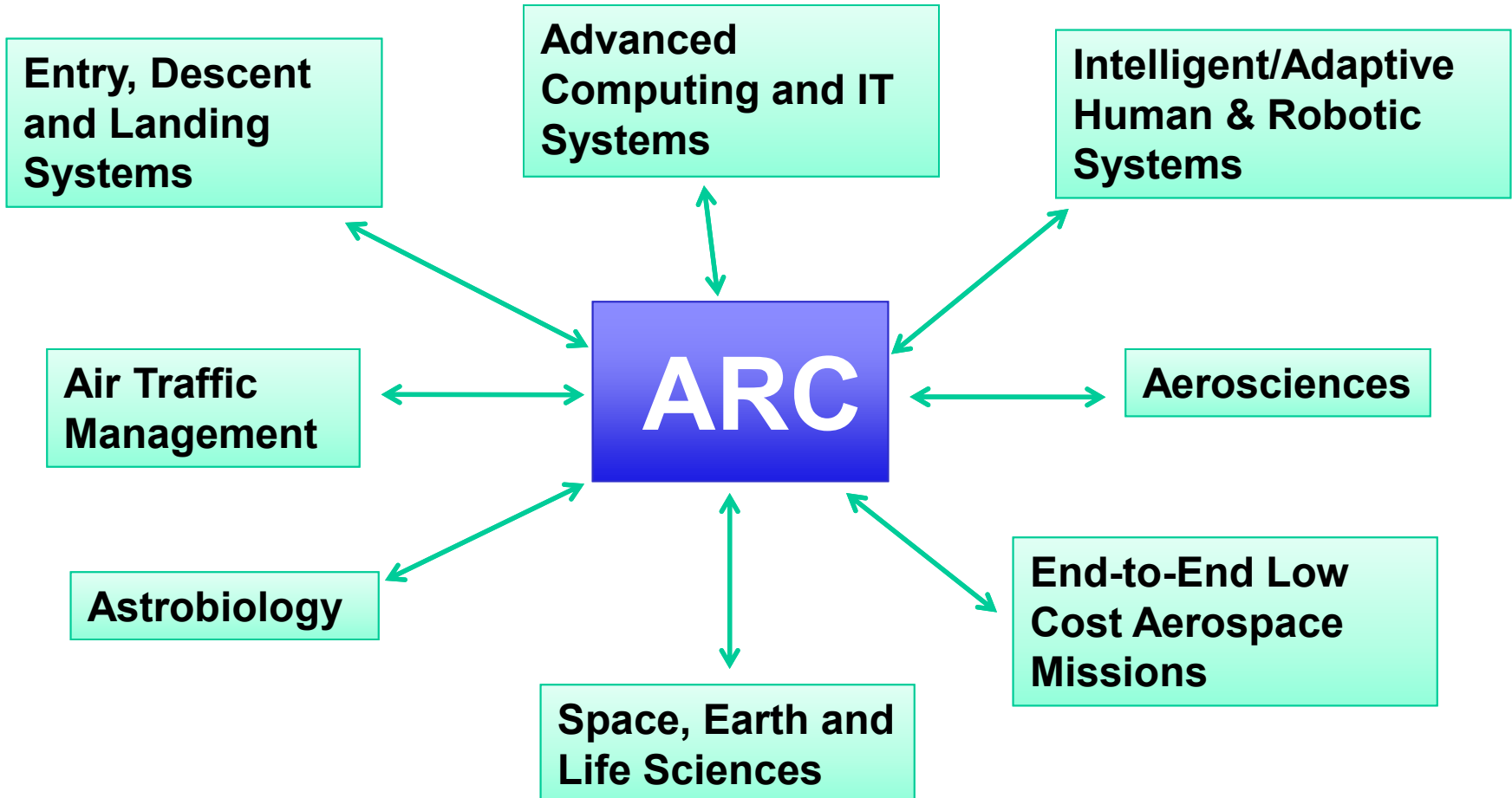




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ARC CORE COMPETENCIES



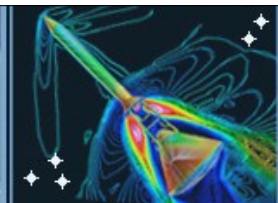
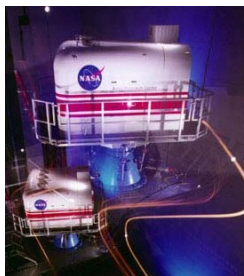
Total Available TCAT points = 250



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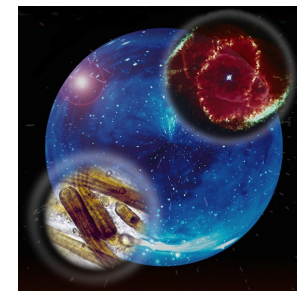
Ames Technology Areas



Aerospace and Aeronautics



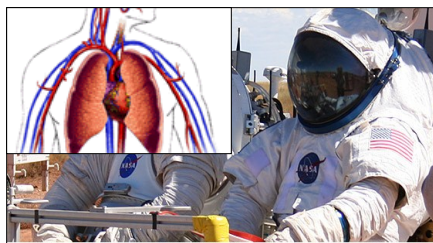
**Integrated Systems Health
Management (ISHM)**



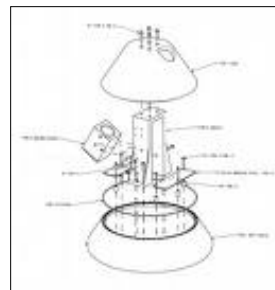
Astrobiology Institute



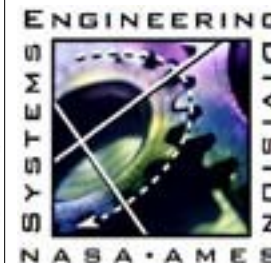
Small Satellite Systems



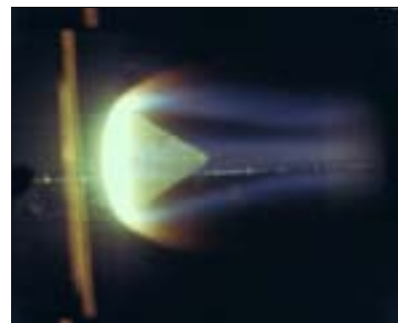
BioTech/Biomedical



Systems Engineering and Design



Robotics and Artificial Intelligence



**Materials Science and
Entry Systems**



**Software and
High-end Computing**



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Astrobiology Institute

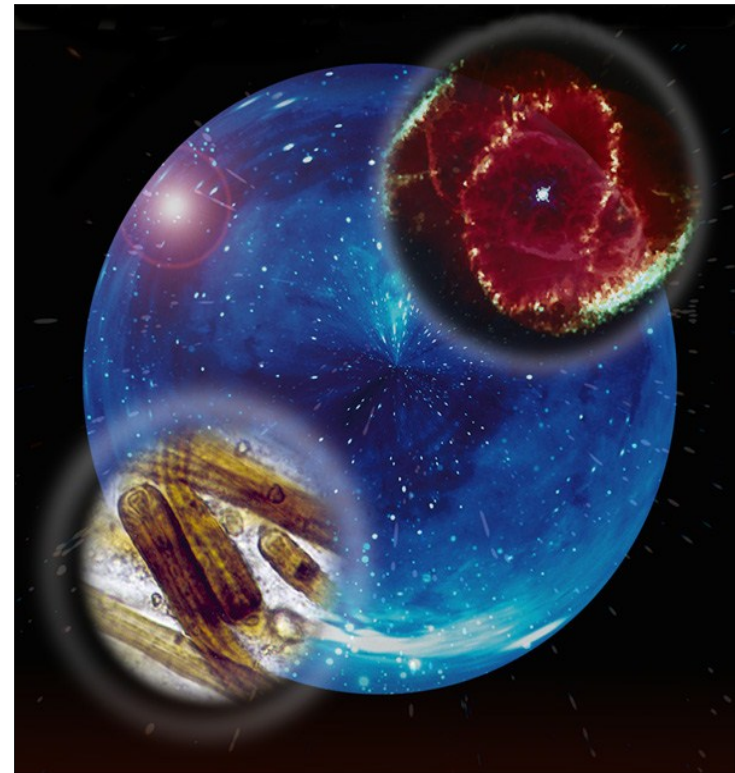
Scientific Study of Life in the Universe

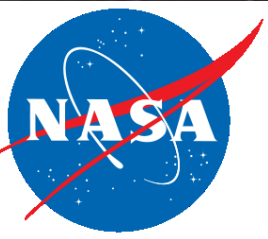
Three Fundamental Questions

- ▶ How does life begin and evolve?
- ▶ Does life exist elsewhere in the universe?
- ▶ What is life's future on Earth and beyond?

NASA Astrobiology Institute at Ames

- ▶ Dr. Michael Meyer, Interim Director
- ▶ 12 Lead Member Institutions
- ▶ 6 International Partners





SSERVI: A Virtual Institute

...established to advance basic and applied lunar and planetary science research and to advance human exploration of the solar system through scientific discovery.



Dr. Yvonne Pendleton, Director

- Headquartered in the NASA Research Park at NASA Ames.
- NASA initially selected 9 research teams from 7 states
- Cooperative Agreement Notice (CAN) awards every ~2.5 years, with award periods of 5 years per team.
- 7 International Partnerships
- The Institute is funded jointly by HEOMD and SMD to bring science to bear on issues related to potential targets for human exploration.
- Transitioned from successful NASA Lunar Science Institute (NLSI) to broaden research base to other science and exploration destinations (eg. NEAs, Phobos & Deimos).





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NASA Aeronautics Research Institute (NARI)

What is NARI?

- NARI is a virtual institute. It is comprised of multi-institutional, multi-disciplinary research teams creating new tools and technologies for reducing air traffic congestion and environmental impacts, improving safety, and designing aircraft with unconventional capabilities.

What does NARI do?

- NARI facilitates technical exchanges, solicit research proposals, award research grants, and use advanced communication technologies such as Web-based seminars to disseminate research findings.

Why did NASA Aeronautics establish NARI?

- **NASA wants to make deliberate investments in innovative, early stage, and potentially revolutionary aviation concepts and technologies.** The NASA Aeronautics Research Institute provides an opportunity for innovation not just in the technical portfolio, but also in the management of it.



Established March 2012. Michael Dudley, Director



National Aeronautics and
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Current Active Facilities, 2014



**National Full Scale Aerodynamic
Complex, 80x120 Wind Tunnel**



**Vertical Motion
Simulator**



**Small Spacecraft
Development Facility**



Unitary Plan Wind Tunnel



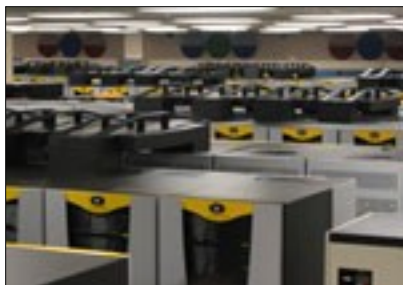
SOFIA



Machine Shops



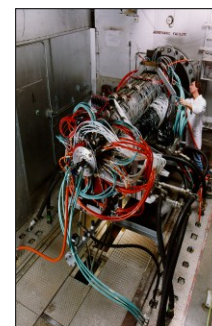
Small Satellite Lab



**Pleiades - Columbia
Super Computer**



Ballistic Range



Arc Jets

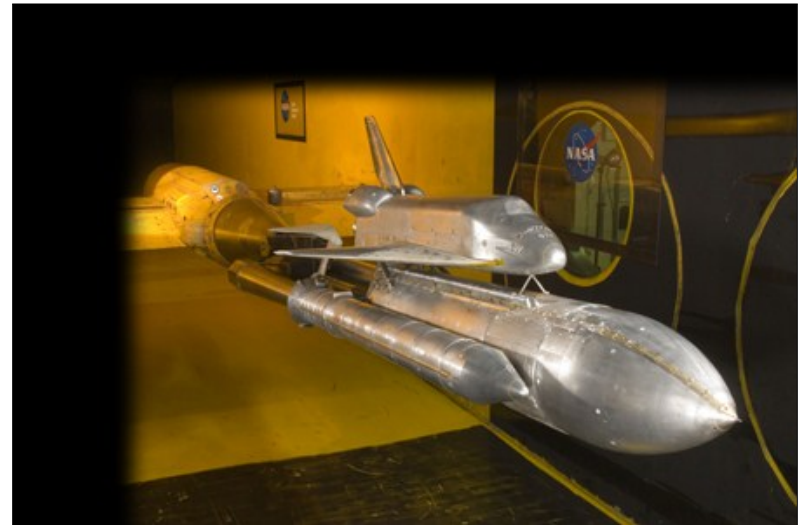


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Wind Tunnels

Space transportation vehicles require significant wind tunnel testing to address configuration development for planetary exit and reentry challenges.





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Space Administration



Simulators

Future Flight Central



**Vertical
Motion
Simulator**



**Crew-Vehicle
Systems
Research Facility**



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TCAT

Technical Capabilities Assessment Team



National Aeronautics and
Space Administration

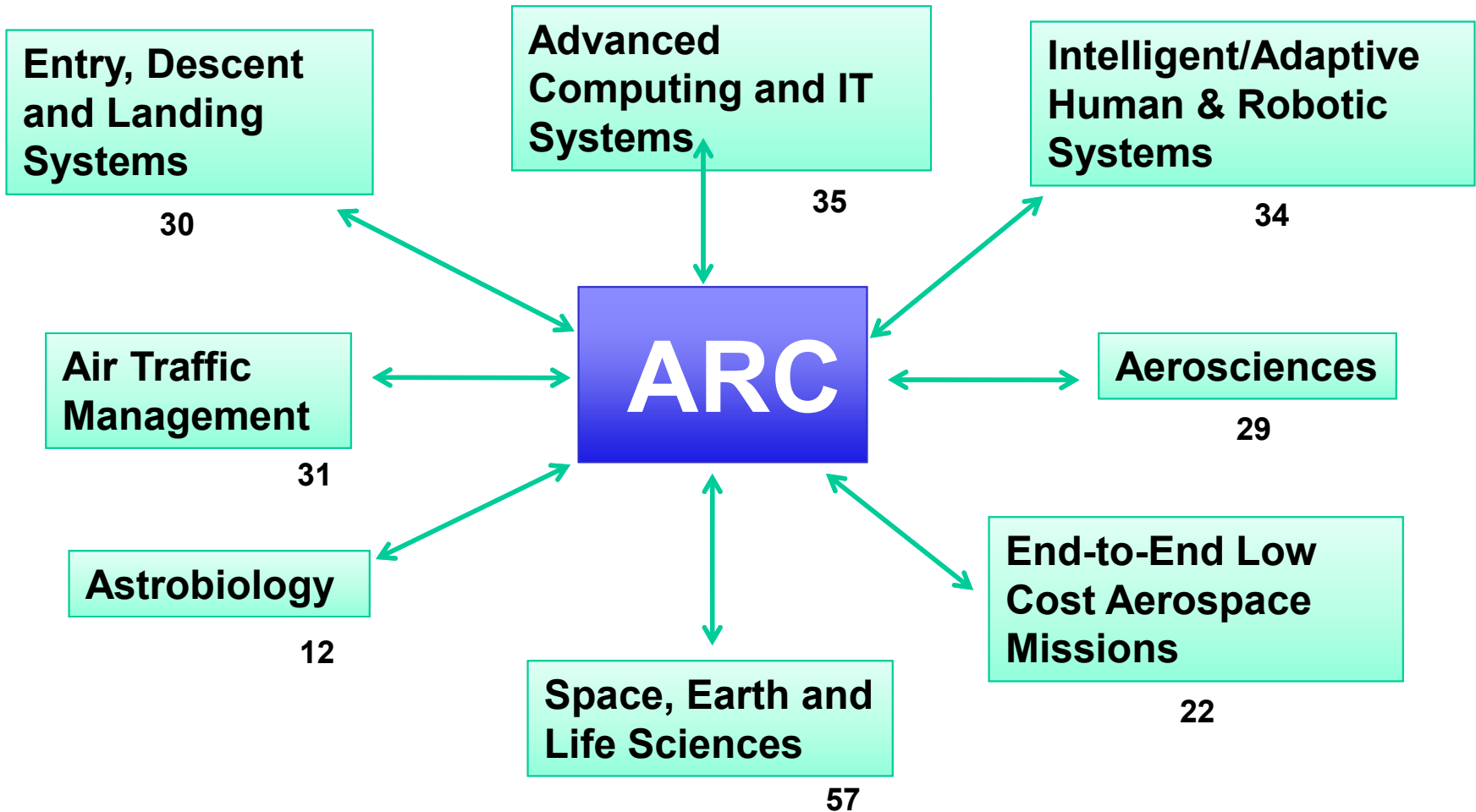


TCAT is a structured methodology designed to:

- ◆ Strategically identify the technical capabilities required to support Agency goals.
- ◆ Enable decision makers to make informed decisions on strategically investing/divesting within the budget while strengthening innovation in critical areas needed to advance our mission.



ARC CORE COMPETENCIES





National Aeronautics and
Space Administration

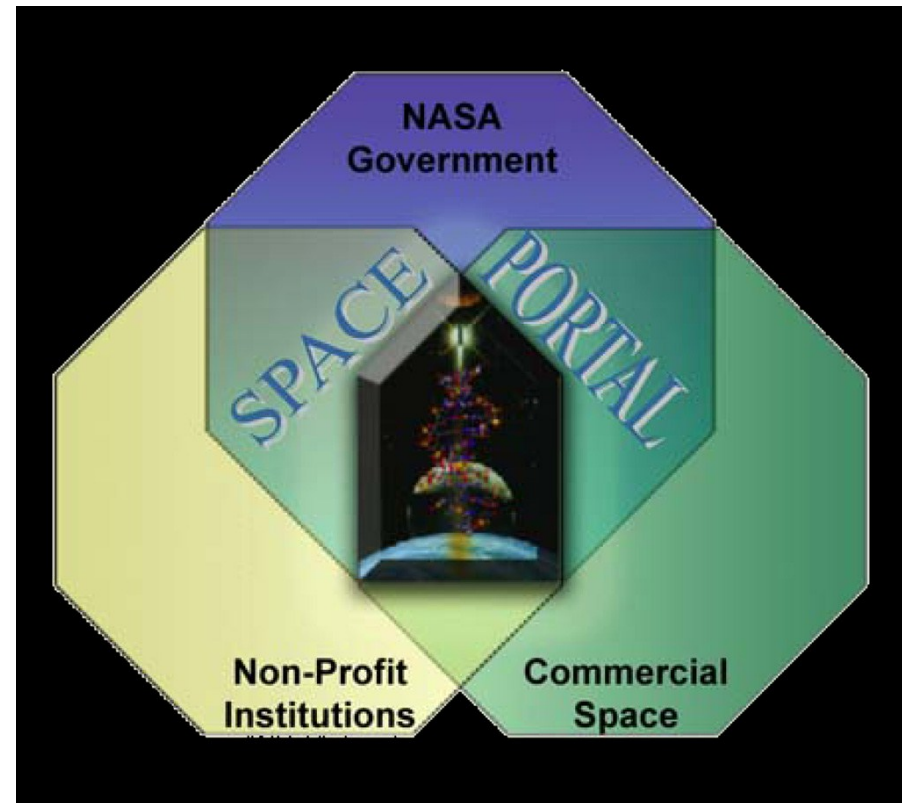


Emerging Office Space

NASA partnerships to explore collaboration in space launch systems and payloads launched from aircraft

NASA Ames is a West Coast 'space portal' for affordable small satellites and other scientific and commercial payloads

Areas of collaboration to include mission, vehicle, and payload concept analyses; systems engineering; and payload integration, as well as use of NASA Ames' facilities, such as its wind tunnels, arc-jet facility, flight simulators, hangars and runways





National Aeronautics and
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NASA Research Park

Innovative Collaboration in Science, Engineering & Education

90+ Partners Today

University Associates

Google-North East Section

University of California/UARC-Bldg. 555

M2MI Corporation-Bldg.19

Carnegie Mellon University-Bldg. 23

San Jose State University

-Metropolitan Technology

Center in Bldg. 583C

Foothill-De Anza Community College

United Negro College Fund Special

Programs Corporation-Bldg.19

Space Technology Center

-San Jose State, Stanford, Santa Clara Univ.,

Utah State Univ. /Micro Satellite Classes

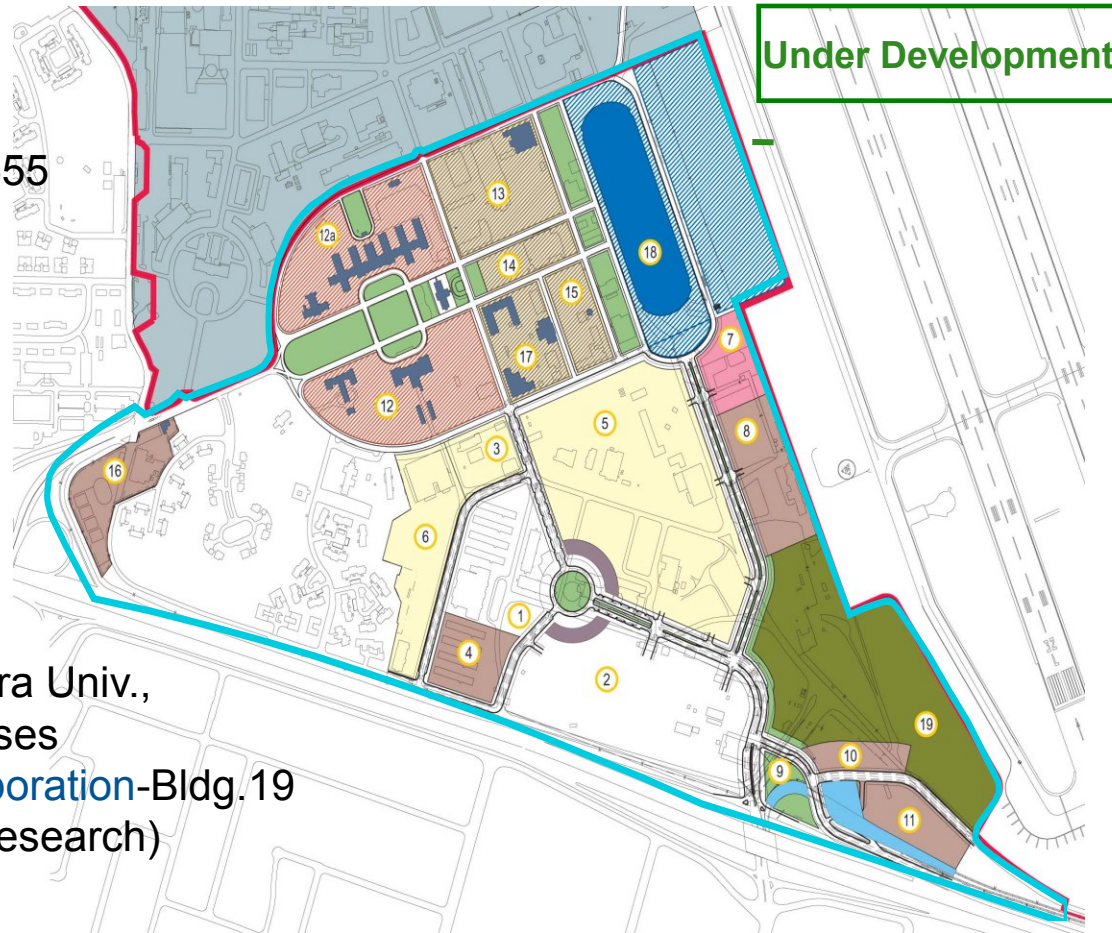
Kentucky Science & Technology Corporation-Bldg.19

Bloom Energy-Bldg. 543 (Fuel Cell Research)

Industry Partners-Bldg. 566 & 19

UAV Center-Bldg.18

International Space University





National Aeronautics and
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Educational Activities



Student Space Biology
Research Program (Ames
PAO Education Program)



Foothill DeAnza
Internship Program



Minority University Research
and Education Program
(MUREP)



JASON Project



NASA Explorer Schools



Robotics Alliance Project



Ames Academy



Aero Expo



Ames Exploration
Encounter



California Academic
Partnership Program



First MOU with Santa
Clara University

1960

1970

1980

1990

2013

Ames
Cooperative
Education
Programs

Stanford
Visiting
Professors
Programs

1950

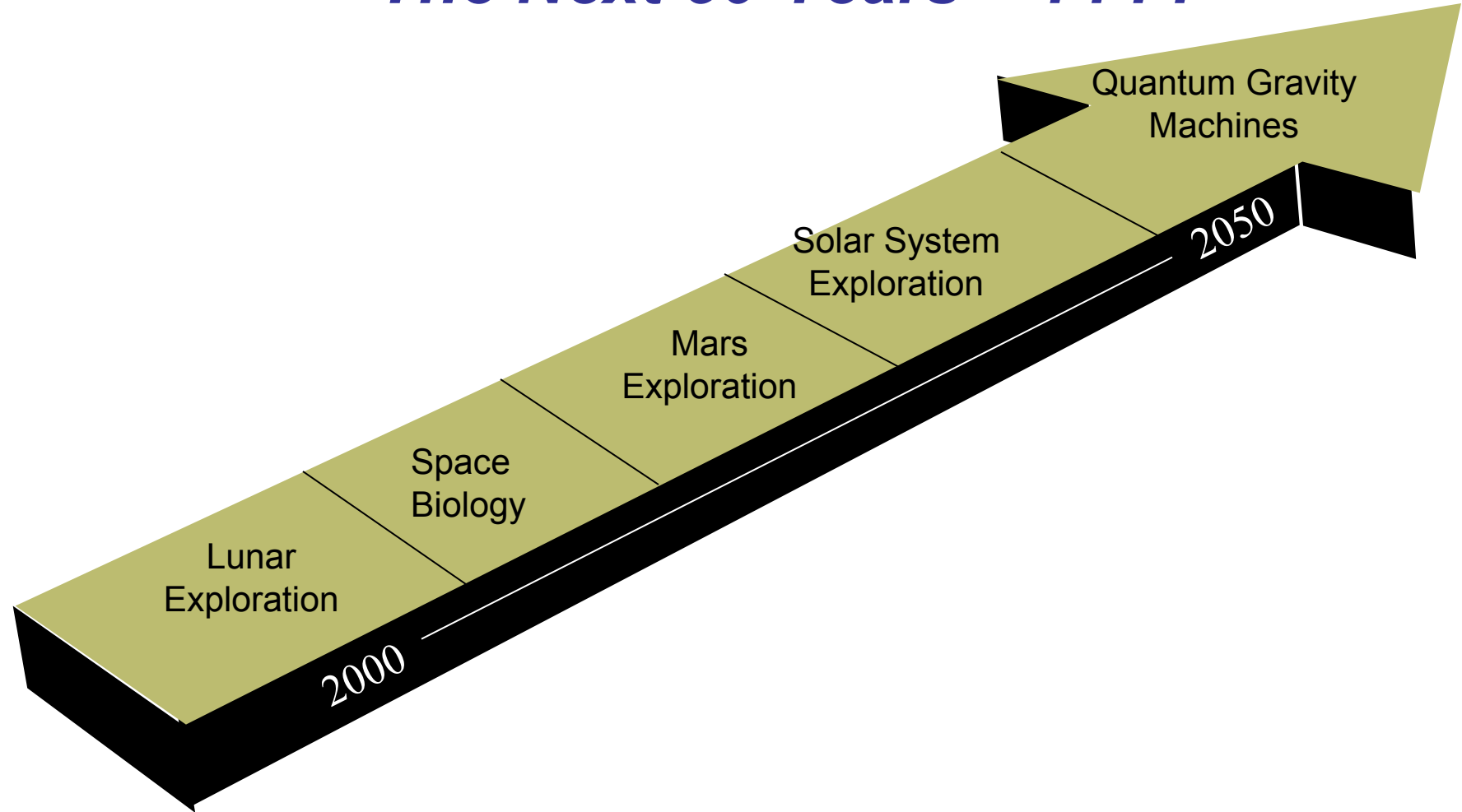


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The Next 50 Years – ?????

?





National Aeronautics and
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END